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Variations in Complete Blood Count, in Pre and Post Hemodialysis Patients of Chronic Renal Failure

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Abstract

Objective: To determine variations in complete blood count (CBC), in pre and post hemodialysis patients of chronic renal failure

Methodology: This cross-sectional study was conducted in the physiology department and data were collected from urology department I at Liaquat university Hospital Hyderabad from April 2021 to September 2021. Patients with chronic kidney disease between the ages of 18 and 50 underwent hemodialysis of either gender. Blood samples were taken before the dialysis with anticoagulant and serum tubes for hematological investigations such as RBCs, hemoglobin, WBCs and platelets. After dialysis blood samples were re-taken with anticoagulant and serum tubes for hematological investigations. Hematological parameters were compared to see the hematological alteration pre and post dialysis. Chronic kidney disease was evaluated as per operational definition. All the data were entered in the proforma. All the data were entered into SPSS 26.0 version.

Results: A total of 167 patients were studied, for the assessment of hematological parameters and vitamin B12 in pre- and post-dialysis. The mean age of the patients was 43.23+12.90 years. Males were 61.1%, and females were 38.9%. Average duration of dialysis was 13.40+2.88 months. As per pre- and post-hematological parameters the hemoglobin level was statistically significant, while RBC, WBC and platelets were statically insignificant (p->0.05).

Conclusion: As per the study conclusion, the hematological parameters, were observed improved significantly after dialysis.

Key words: CKD, dialysis, Hb, RBC, WBC, Platelets

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Introduction

Chronic kidney disease (CKD) seems to be a significant public health issue, with the prevalence of 8%–10% throughout the world in the adult population.[1] CKD is more common than other chronic conditions and is among the top 12 causes of death worldwide.[2] 700 million people worldwide with CKD at any stage and 1.2 million fatalities were reported in 2017.[2] By 2040, scientists predict 4 million deaths will be caused by CKD.

Compared to other chronic illnesses, the mortality rate brought on by CKD has not significantly decreased.[2,3] Its frequency in Pakistan is estimated to range from 12.5% to 31.2%.[4] Wide-ranging physiological systems are affected by CKD, which is caused by the glomerular filtration rate's steady reduction. It is a predictor of death from all causes and cardiovascular disease, as well as a decline in quality of life. One of the CKD consequences that worsens with the disease's intensity is haematological problems. The most frequent haematological consequence of chronic kidney disease (CKD), anemia, is becoming more widespread due to the gradual drop-in glomerular filtration rate.[1,5] Anemia can arise with CKD for a variety of reasons, including uremic and situational factors. Aside from the primary pathophysiological cause of anemia, which is a decrease in endogenous erythropoietin production, other risk factors for anemia include a lack of iron, a lack of the B vitamins B12 and the folic acid, a reduced lifespan of RBC, loss of blood, a "uremic environment," hyperparathyroidism, inflammatory processes, aluminum toxic effects, and hypothyroidism.[1,6,7] Various stages of CKD are linked to haematological abnormalities.

Decreased hemoglobin is more common in CKD patients along with other haematological indices, such as RBC, HCT, MCHC, RDW, MCH or MCV, have also seen significant changes. A therapeutic approach for

advanced chronic renal disease is hemodialysis. Individuals having CKD frequently have an iron deficit; it affects about 50% of those with non-dialysis-dependent >50% among those undergoing dialysis.[8] Platelet levels have generally been assessed prior to dialysis, 15-30 minutes during HD, and at intervals the conclusion of treatment in investigations evaluating HD's impacts on platelets By the completion of the HD session, the platelet concentration almost always recovers to pre-HD levels or slightly exceeds them.[11-13] During HD, platelets might become significantly activated. Platelet degranulation is indicated by platelet cell surface markers. Blood exposure to the rolling pump section causes some stimulation, and microbubbles can possibly be involved.[11] Additionally, other particular factors including dietary deficits, hemoglobinopathies, and viral illnesses increase the incidence of anemia and alter pattern in this environment.[9]

The purpose of this study was to detect hematological alterations and compare the degrees of variations in pre- and post-dialysis phases among CKD patients visiting Dialysis Centers in Hyderabad Tertiary Hospitals.

Methodology

This cross-sectional study was conducted in physiology department, and data were collect from urology department I at Liaquat University Hospital Hyderabad. The study was conducted over a period of six months, from April 2021 to September 2021. Non probability consecutive sampling was used. Patients between 18 to 50 years of age, with chronic kidney disease underwent hemodialysis of either gender were included. Patients unwilling to participate in the study and patients with thalassemia or other endocrinology disorders and pregnant women were excluded. This study was performed after the approval of ethical committee of institute. Subjects were selected from the urology department of LUMHS after permission of head of department. Clinical exams were performed in their entirety. Pre and post dialysis, blood specimens were obtained in serum tubes and anticoagulant for hematological tests including RBCs, hemoglobin, WBC and Platelets. The proforma was filled out with all of the information. Analysis of data was done by using SPSS version 20.

Results

A total of 167 patients were studied, for the assessment of hematological parameters in pre- and post-dialysis. The mean age of the patients was 43.23 ± 12.90 years. Out of all study subjects the males were in majority 61.1%, and females were 38.9%. 86.2% were married and 13.8% were unmarried. Average duration of dialysis was 13.40 ± 2.88 months, mean systolic and diastolic blood pressure was 135.44 ± 18.05 and 88.98 ± 12.44 respectively, mean pulse rate was 83.79 ± 5.99 and average body weight was 58.38 ± 13.23 kg as shown in table I.

Table I: Demographic characteristics of the patients (n=167)

Variables		Statistics	
Age		43.23 ± 12.90 years	
Duration dialysis		135.44 ± 2.88 hours	
Systolic BP		135.44 ± 18.05 mmHg	
Diastolic BP		88.98 ± 12.44 mmHg	
Gender	Male	102	61.1
	Female	65	38.9
	Total	167	100.0
Marital status	Married	144	86.2
	Unmarried	23	13.8
	Total	167	100.0

As per pre- and post-hematological parameters the hemoglobin level was statistically significant, including RBC, WBC and platelets were also statically significant according to pre and post dialysis (p-<0.05). Table II

Table II: Comparison of hematological parameters in pre and post dialysis (n=167)

Variables	Paired Samples Statistics				
	Mean	SD	Mean differ.	Correlation	p-value
Pre HB	8.41	1.66	-.222	.687	0.028
Post HB	8.64	1.61			
Pre RBC	2.92	0.66	-.468	.326	0.001
Post RBC	3.39	0.88			
Pre WBC	6.34	2.37	-.528	.582	0.043
Post WBC	7.87	2.76			
Pre-platelets	204.14	26.68	-22.23	.308	0.001
Post platelets	227.17	29.20			

Discussion

CKD adversely affects the hematopoietic system, most common clinical manifestation being anemia and is often contributing substantially to the morbidity and mortality of the condition.[10] In this study, a total of 167 patients were studied, for the assessment of hematological parameters.

The mean age of the patients was 43.23±12.90 years and out of all study subjects the males were in majority 61.1%, and females were 38.9%. Similarly, Hakim YA et al[11] reported that the most comprising male patients (66.3%) percent, with the most common age group (45-54) accounting for 18 percent. On the other hand, Kesarkhane M et al[10] included sixty-six adult End Stage Renal Disease patients, 51 males (77.27%) and 15 females (22.73 %). The mean age of male and female patients was 41.03±12.6 years and 41.20±10.31 years respectively. Overall mean age was 41.03±12.6 years. In this study as per pre- and post-hematological parameters the hemoglobin level, RBC, WBC and platelets were statically significant according to pre and post dialysis (p-<0.05). Similarly, Al-Haytham AK et al[12] observed that the average of RBCs, Hct, Hb, and RDW indices that appeared in renal malfunction cases before and after HD had statistically significant difference (p < 0.05). Above findings almost similar to our study.

In this study, it was also observed that, excluding basophils, the average of leucocyte counts as well as the mean counts of each, neutrophils, lymphocytes, monocytes, and eosinophils, exhibited statistically significant increases in renal dysfunction patients in post-HD procedures compared to those in pre-HD procedures. The rise in differential counts and leukocytes following HD was attributed to the fact that individuals are often hypervolemic during the start of HD, with lower differential count and leucocyte levels. The results of this study demonstrated that there were no statistically significant connections between the length of time a patient was on dialysis and each of the differential and leucocyte counts. Although, Mohamed et al[13] observed that the length of time subjects was on HD had no effect on their leukocyte count, and they also observed that platelet and leukocyte counts were slightly enhanced following hemodialysis (HD). Alghythan AK et al[12] also found similar findings.

In this study WBC were found increase slightly when compared the pre procedure average 6.3429±3.09426 with post procedure average 6.8714±3.37500, while findings statistically insignificant (p-0.083). On the other hand, Alghythan AK et al[12] reported that there was a discrepancy in the average frequency of differential and leucocytes counts among renal failure subjects in post-HD methods; the WBC counts among post-HD cases (7.46±1.87) were statistically significantly higher than those in the controls (6.30±1.88) (P<0.05).

In this study, platelets were slightly increased after procedure, while both pre and post averages were in normal range without a significant difference. Alghythan AK et al[12] reported that when comparing the patients for pre and post-HD, mean counts of platelet showed a statistically significant decline, while still within expected level. Our findings contrasted with those of Yenicerioglu et al[14], who found a substantial reduction in platelets following HD in comparison to pre-HD interventions. Mohamed et al. found no link between platelet counts and the length of time patients had been on dialysis. In post dialysis period, they observed that most hematological indices, and also partial thromboplastin and prothrombin times, increase.

In consensus with this study's findings concerning improved haematological parameters, Muhammad A et al[15] revealed that HCT, HB, RBC, RDW, and MCHC significantly raised in post-HD than the pre-HD, while MCV and TLC declined significantly, however Platelets and MCH did not decrease significantly in post-HD cases. Only MCH was found to be non-significant while MCHC was shown to be significant among CKD patients when compared to the controls. RBCs, MCHC, Hct, and RDW all increased significantly following dialysis, perhaps due to the elimination of excess waste liquids from hypervolemic subjects using the ultra-filtration approach. However, few measures, including MCV and MCH, indicated a drop in post-dialysis levels and on other hand similar findings were reported by other authors.[16]

Conclusion

Hematological parameters, were observed to improve significantly after dialysis. However, the current study had several limitations, and this improvement in haematological pattern in contrast to literature may potentially be one of them. like the post dialysis haematological assessments were done in many cases those after blood transfusion. However, additional large-scale studies excluding confounding factors are recommended to observe comprehensive and conclusive findings.

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